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A Letter from Mr. Charles Leigh of Brazen-Nose College in Oxford. to Dr. Rob. Plot Director of Experiments to the Philosophical Society of Oxford, and one of the Secretaries of the Royal Society.

SIR,

SINCE you gave me some specimens of the water of *Latron*, and likewise of *Nitrian Nitre*, I have found that those Descriptions which the Antients give of it, exactly agree with those specimens we have here; their encomiums of it were so many, but so different the names which they ascribed to it, as a sceptic indeed might equally question whether or no they writ of any thing else, or whether or no they writ of any such thing. That we might therefore the better understand the writings of the Antients concerning it, and the *Phænomena* which it afforded here, I have thought convenient to make use of this method. I shall in the first place shew whence *Nitre* has its denomination. In the second, the different names which ancient Authors ascribe to it. In the third, the different places whence it comes. In the fourth, a description of it as it is when a *Compositum*. In the fifth, the number of its principles when chymically resolved. In the sixth, the rise of them. In the seventh, its separation from the water of *Latron*. in the eighth, its use in Physick. In the ninth, in Agriculture and Mechanicks. In the tenth, wherein it differs from *Sal Armoniac*. In the eleventh, from *Salt-Petre*.

That all *Nitre* took its name from a Town in *Ægypt* called *Nitria*, I shall take for granted: I shall therefore in the next place give you an account of the different names, which by Authors are ascrib'd to *Nitre*.

By *Hippocrates* ^a it is sometimes called *Sal Ægypti*, *Sal in aquis crescens*, and *Nitrum Rubrum*. By *Basil. Serpens Terrenus*. By *Vitruvius*, *favilla salis*.

By *Pliny* ^b *Spuma Nitri*, and *Ros pinguioris Naturæ*, by the Græcians *Halmiraga*.

By *Encelius* ^c it is called *Cryso-Colla*, *Baurac*, *Sal lucidum*, *Sal petrosum*, *Sal Anderenæ*. But the word *Baurac* by the *Babylonians* is more restrain'd, for they divide *Nitre* into two species, the one they term *Sal petrosum*, *purpureum*, *Modice amarum*; the other species they term *Baurac*, which they used in seasoning their meat, the former of these may probably be the *Nitre* here spoke of, and the latter *Salt-Petre*.

By *Jungius* ^d and *Hofman* it is called *Cerberus Chymicus* and *Sal infernalis*. By *Rulandus* ^e and *Johnson* it is called *Fex vitri*, and *Cinis Clavellatus*, and so by *Fallopian*, and sometimes *Cabalatar*, *Algali*, *Anatron*, *Tincar*, *Sago*.

Here likewise it is to be noted, that *Aphronitrum* call'd by *Schwenckfeldius* in his Tracts *de Fossilibus Silesiæ* (*flos Asiæ* and *Spuma Nitri*) is not (as I conceive) specifically distinct from the *Natron* here spoke of.

For according to *Molenbrochius* ^f and *Junken* ^g that will ferment with an Acid, and is commended in the same distempers, as the *Nitre* of *Nitria*, again it's said by *Pliny*, *fontibus quibusdam innatat, videturque Nilo deferri*.

By *Encelius* it's said to be found either in *Armenia*, *Rabbath*, *Africa*, *Rome*, *Ægypt* or *Babylon*, and therefore by him is divided into these six species. *Nitrum vel est Armen. Afric. Ægypt. Rabbath. Rom. vel Babyl.* By *Wormius* it is said to be found in *nova Hispania*.

The *Natron* may be described thus; it is an Alkaly Salt perforated like a sponge, and of a lixivial tast; and

(a) *de natura & morbis mulierum*. (b) *naturali historia de nitro*. (c) *dere metallica*. (d) *physic*. (e) *Lexicon. Alchymicæ*. (f) *de Arthritide*. (g) *Medicus*.

thus

thus I find it describ'd by *a Pliny*, *a Mathiolus* *b* and *Agri-*
cola. *c*

Its principles I take to be chiefly two, *viz. a Sal ma-*
rine, and an *urinous Salt*.

That it contains a *Sal marine* seems manifest by these experiments; first because a solution of the *Natron* has the same taste that a solution of *Sal marine* hath; secondly in evaporation the particles of the *Natron* incrustated upon the surface of the water as the particles of Sea-Salt do in evaporation. Thirdly because the *Natron* is perforated, which proceeds (as I suppose) from a *Sal marine*, for that when it crystallizeth, shoots with little cavities. Fourthly if the *Natron* be mixt with Salt of Tartar it emits the same spirit, as *Sal Armoniac* when mixt with the same Salt. And lastly, that it contains a Sea-Salt seems plain from *Cesalpinus*. says he, *efflorescit etiam sponte non solum in salinis ad similitudinem lanuginis canescentis, sed etiam in vasis in quibus sal continetur.*

But here it is to be noted that though the *Nitrian Water* is of a bluish colour, and makes a brisk fermentation with an Acid; yet a solution of *Natron* looks clear and will not ferment with an Acid. The reason why a solution of the *Natron* looks clear, though the *Nitrian Water* which is but a solution of the same salt is of a bluish colour, may perhaps be this;

I suppose that the water of *Natron* receives its redness from a red clammy substance, which serves chiefly to cement the two salts together, and this I the rather conjecture because after a solution of the *Natron* had pass'd through a filtre there stuck to it a red clammy matter, and the solution was clear; and the reason why a solution of the *Natron* will not ferment with an Acid, I conceive to be this; because that in a perfect dissolution its parts being separated one from another by the parts of the water, their struglings are too weak to make an effe-

(a) *nat. hist.* (b) *comment. in Dioscor.* (c) *cap. de nitro.*

vescency

vescency with an Acid; and in this I was further confirm'd by these two experiments.

I found that if into a solution of the *Natron* I pour'd an Acid, while the water look'd whitish or disturb'd the Salt not being perfectly dissolved it made a brisk fermentation: but when the water came to be clear, the Salt then being perfectly dissolved, if I then poured an Acid upon it, it would not ferment: I likewise found that this solution being evaporated to a third part would ferment again.

It's second principle I take to be an *urinous Salt*, first because if mixt with salt of *Tartar* it smells like *Sal Armoniac* when mixt with the same Salt.

Secondly, when it was distill'd with salt of *Tartar* in a Retort, it afforded an urinous spirit as piercing as the spirit of *Sal Armoniac*.

I come now to the rise of its principles *Sal Marine* and a *Volatil Alkaly*; *Sal Marine* being a fossil Salt I shall take for granted it receives from the earth and shall endeavour to illustrate that it hath its Volatile Alkaly from the air, first because its said by *Pliny*, *Spumam Nitri* (which is the *Natron* here spoke of) *Antiqui negabant fieri nisi cum ros cecidisset*. By Mounfieur de la Chambre, it is affirmed that three or four days before the Nile begins to overflow, there falls a certain dew which hath a fermenting vertue, and leavens a past expos'd to the air, and at that time saith *Pliny*, and Mounfieur de la Chambre the Nitre Pits grow full of Nitre, and *Sands Vanselebius* and several say, that tho 500 in a day die in *Grand Cairo* of the Plague before the beginning of the inundation of *Nile*, yet the very day after there does not one die, which doubtless could not proceed from any other reason, then because at that time, the air was impregnated with this Volatile Alkaly, for at that time the *Nitre* Pits grow full and this dew falls; (this I think) may sufficiently hint to us the great use of its volatile spirit especially in pestilential distempers.

Lastly, about that time that the *Nile* begins to overflow those

those specimens which we had here grew heavier by being exposed to the Air.

Here it is to be noted that this *Alkaly* is not made so by fire : I cannot therefore conclude with *Helmont* that all Alkalies are made such by that element.

The next thing to be considered is its separation from the water in *Latron*, of which the Learned Dr. *Huntington*, (who was at *Nitria*) gives us this account.

There is a town in *Egypt* called *Nitria* which gives name to the *nitrian Desert*, where there is a lake called *Latron*, taking up an Area of six or seven acres situate about 30 miles West and by South from *Terana*, a Town lower upon the *Nile* than *Grand Cairo*, and about the same distance North-west from the *Pyramids*, from the bottom of this Lake this sort of Nitre called *Natron* riseth to the top (as they do apprehend) and there by the heat of the Sun condenses into this kind of substance. That all the Nitre comes from the bottom to the top I dare not affirm, & shall therefore premise some *Phænomena* which it afforded in evaporation, before I give you my conjecture about it.

I took an evaporating glass which held about 4 ounces, and poured into it 2 ounces of the *nitrian Water*, this I set upon a sand furnace, giving it fire by degrees, as soon as the water was warm the particles of the *Nitre* began to swim upon its surface in stragling and uneven numbers, these after a while united, and at last there arose Salt sufficient to cover the whole superficies of the water, I took then a thin glass and skim'd off this Ice, but could scarce take it all off before it was seconded by another, and thus the salt did rise successively in films as long as there was any water in the glass, these films had the colour and taste of the Nitre which came from *Nitria*, and did like it ferment with an Acid. And these are they which by *Pliny* are called *Flos salis*, and if I mistake not the same with that which *Herodotus* says they make their Mummy with. If therefore by the languishing heat of a digesting furnace, the nitrous particles could separate themselves from the
water,

water, and over that spread themselves in an ice, it may be as probable, that by the greater heat of the Sun, the Nitre of *Latron* is separated from the water after the same manner: And as in the evaporation of other mineral waters, when the water is not strong enough to hold up the Salt, it is generally covered with a thin film; so I suppose in evaporation of the *Natron*, some parts of the water being flown away, the particles of the *Sal Marine* branch one into another, and so incrustate upon the surface of the water.

In this *Hypothesis* I was the further confirm'd, by this Experiment, I took some of the *Natron* and dissolved it in water, and set it to evaporate, and I found that the Salt did not incrustate upon the water till 3 parts of the water was evaporated, it did not therefore seem probable that the Nitre came all from the bottom to the top, and so condensed by the heat of the Sun, but that they incrustated when the saline particles brancht one into another, some of the aqueous parts being exhal'd.

The reason why its volatile Alkaly in evaporation does not fly quite away, is because it is held there by the *Sal Marine*.

The next thing to be considered is its use in Physick: By *Pliny* it's commended in Ulcers, Inflammations, Palsey in the tongue, Consumptions, Collick, Hemorrhages, Purulent ears, and intermitting Fevers. By *Gallon* it's said, *desiccet, ac digerit, multo autem majus ejus spuma*.

By *Agricola* it's prescribed in the same cases, commended as a Cephalic. Of wonderful success in the griping of the Guts, intermitting Fevers and the Leprosie. *Mathioli* commends it in the same cases.

By *Hippocrates* it is commended when the *Menstrua* are obstructed, and again (saith he) *purgat humores albos, convenit in abortionibus ubi puer haud exierit*, he likewise commends it in some kind of barrenness, and to this *Kircher*

cher in his *Mundus subterraneus* alludes, when he says, *Nili aqua in potum redit non modo saluberrimum, sed & fecundandis mulieribus mire opportunum*, and *Petrus Giurius* a, gives us this memorable story out of *Cesius*, that when *Phidadelphus* King of *Aegypt* married his Daughter *Berenice*, to *Antiochus* King of the Assyrians, he commanded her to drink of the water of *Nile*, that she might make her Husband happy in a numerous offspring.

By the Testimony therefore of *Hippocrates* b, *Gallen* c, *Mathiolus* d, *Dioscorides*, *Pliny* e, and *Agricola* f, it appears to have been of great use in Physick.

But here it is to be noted, that when Nitre by the afore mentioned Authors is prescrib'd, that Nitre which is an ingredient of Gun-powder, is not to be understood.

Amongst the Moderns we have this account of it, *Monfieur du Clos* is of the Opinion that most of the mineral Waters in *France* are impregnated with this sort of Nitre, and that all their Cures are done by it g.

Molenbrochius affirms a tincture of *Apbronitrum* to be of wonderful efficacy in the Stone h: this I the rather credit, because it's said by *Juncken* in his *Medicus*, the Nitre of *Nitria* is of so piercing a spirit, that it doth not permit either Stone or Rock to be there about. And *Ten Rine* in his *Meditations de veteri medicina* affirms it to be of wonderful success in the same distempers.

The next thing to be considered is its use in Agriculture, and in treating of this, I think it convenient to

(a) *Arcanum cidularum*. (b) *de natura & morbis mulierum*.
(c) *de nitro*. (d) *comment. in dios.* (e) *nat hist.* (f) *de fossil.*
(g) *mineral waters of France*. (h) *de Arthrit.*

premise one *Phenomenon* which it afforded in evaporation. When the Salts had spread themselves over the water in an Ice, those thin plates after a while would break, and ascend in perpendicular lines to the very top of the glass, I do therefore conjecture, that *Nitre* may be said to fertilize the ground after this manner, its volatile particles being heated by some subterraneous fire, or else by the warmth of the Sun, they do quickly ascend in the small tubes of the Plant, and so by their elastick nature carry along with them or force before them, those particles which as they differently convene together, constitute the different parts of the Plant.

But this conjecture will be made something the more probable, by an Experiment in *Kircher*'s; where he says if you take a wooden tube, and put into it Tartar, quick-Lime, Salt, and the Urine of a Wine drinker, reduced into one mass, which is to be hardened in the Sun; and after that set it in a cold Cellar, by the help of *Salt-Petre* from the before mentioned Mass, you will not without admiration see Flowers branch out of it; yea such is the force of *Nitre*, that if in a Glass kept close shut, you put the juices of some nitrous Herbs on the before mention'd Mass, the *Nitre* contain'd within it being pregnant with Spirit, will force it self through the very pores of the Glass.

Mr. *de la Cambre* says, Plants do grow in *Aegypt* in such abundance, that they would choak one another, if they were not hindered by throwing sand upon the fields, insomuch that the *Aegyptians* must take as much

(b) *Mund. sub. cap. de nitro.*

pains

pains to lessen the fatness of their Land, as other Nations do to encrease the fatness of it.

In Mechanics we have this account of it: It's said by *Pliny cap. de Vitri Inventione*, that a company of Merchants being thrown upon a shore where there were not any stones to be found, were forced to take great pieces of Egyptian *Nitre* out of their ships, and make walls, upon which they hung their boyling Kettle, the *Nitre* being heated by the fire, mixt with the sand, and ran into several streams of glass, which afterwards hinted the way of making Glass. It is likewise of use in Dying, for *Pliny* and *Vitruvius* affirm, that by the help of this, the true Azure is made, and that without this, there cannot be a true shadow.

In the last place I come to consider wherein it differs from Salt Petre, and Sal Armoniac, it may be distinguished from Salt Petre first by its fermenting: it will ferment with any Acid, but Salt Petre will not: I found that it would ferment with Vinegar as the old Commentators observe in their Comments upon *Jeremiah* and the *Proverbs*, but Salt Petre will not: which gave occasion to some, in those Texts, to alter the word *Nitre*.

Secondly, it may be distinguished from Salt Petre in its taste, for *Natron* hath a lixivial taste, but the other not.

Thirdly, by the volatile Spirit which it affords: for from the one comes over a volatile *Alkaly*, but from the other a corrosive Acid.

Fourthly, the *Natron* affords a red clammy substance, insipid, but the other not; this clammy substance (if

(a) *de Architectura. Lib. 7.*

I mistake not) is that which by *Pliny* is called *ærugo Salis*, this it hath from the earth, and therefore it is again said by *Pliny*, *sunt ibi nitrariae in quibus et rum exit a colore terræ.*

Fifthly, like *Salt Petre* it will not ChrySTALLIZE.

Sixthly, in the fire it makes no detonation. But in this it resembles *Salt Petre*, as that by the flowers of Sulphur is made into a *Sal Prunellæ*, so this if you drop Spirit of Sulphur upon it, shoots into Pyramidal Salt, that is not by the taste distinguishable from *Sal Prunellæ*, though its taste before was lixivial.

From *Sal Armoniac* it may be distinguished first by its colour, for the *Natron* is reddish, the other not. Secondly, by the texture of its parts, in *Sal Armoniac* the parts seem close and firmly knit together, but the *Natron* is spongy and perforated. Thirdly, if mixt with *Sal Armoniac*, *Sal Armoniac* emits the same Spirit as it doth when mixt with quick lime.

But I think it comes much nearer to the nature of *Sal Armoniac*, then *Salt Petre*; first, because it is composed of a Sea-salt, and an urinous Alkaly; secondly, like *Sal Armoniac*, when dissolv'd in water, it makes it extremely cold: And as *Franciscus Hernandez* says in his History of *Mexico*, it produces the same effect when dissolv'd in Wine; but I have not at present the convenience of trying this, the *Specimens* now being but small.

I can-

I cannot therefore conclude with *Kircher* a, that the *Natron* is not specifically distinct from Salt Petre; or with *Libavius* that it is a composition of Alum, Sea-salt, and white-Wine. And these are all the Observations which I have been able to make at present concerning this Mineral, if any more occur, you shall have an account of them, from

Your humble Servant.

C. L.

(a) *Mund. subterr. l. 6. sect. secunda, cap. prim.*

Tuta
